With regard to the display of the present year, the want of observations on November 12 and 13 will not allow us to form a safe judgment as to its character. Probably it has been below the average. As to the individual meteors recorded at this station, they were generally small, and, with one exception, need no comment. The brightest appeared at 5h. 3m. a.m. on November 15, and was estimated very nearly equal to Jupiter. Its path of 12° lay 5° south of β and γ Draconis, and it left a vivid streak there for about five seconds.

As to the numerous contemporary showers of this epoch, they are extremely interesting, and some of them were observed this year with unusual distinctness. In preceding years I have registered a considerable number of Taurids and Muscids at this epoch, but during my late observations not many were noticed. I was, however, watching a region of the heavens far removed from the radiant points of these showers—a fact which may in some measure explain the apparent paucity of their meteors. But on the 15th and 16th a few of the slow-moving Taurids were seen traversing long flights amongst the stars of Leo Minor and Ursa Major. At 2h. 20m. a.m. on November 16 one fell in a path of 17° slightly to the left, and very nearly parallel to the stars ζ and η of Ursa Major. It was brighter than Jupiter, and exhibited a small yellowish-white disk, varying in magnitude in a most curious manner. During its course the meteor appeared to halt and rekindle with increased impetus several times, and short trails of sparks were thrown off at the points of maximum brightness.

Below I give a summary of all the radiant points derived from my a.m. observations on November 15-18 last:—

No.	Radiant	No. of meteors	No.	Radiant	No. of meteors
	° °			° °	
1	149½+21½	11	7	213+75	8
2	154 +41	12	8	157+74	4
3	166 +31	10	9	79+56	6
4	144 +50	6	10	73+42	5
5	125 +41	6	11	190+21	3
6	60 +28	5	12	100+41	5

Nos. 2, 3, 4, and 5 are important. They severally furnish meteors of the swift streak-leaving class. No. 6 represents the centre of a few Taurids, and Nos. 7 and 8 are positions derived from slow meteors not very far from Polaris. Nos. 9 and 10 are a pair of sharply-defined radiants in Auriga, and No. 11 is an entirely new shower which I observed on the morning of the 17th and 18th. Only three of its meteors were recorded, but their paths intersect at a point, and I believe the position is reliable.

The radiant No. 2 at 154° + 41°, near μ Ursæ Majoris, is the best of all, and has often been seen in previous years. It is evidently the same as the "very active shower" described by me in NATURE, vol. xv. p. 158, as observed here from the point 155° + 36°, on November 20-28, 1876. It is also identical with the shower seen from 155° + 35° by Father Perry at Stonyhurst College Observatory on November 13-15, 1879 (*Monthly Notices*, January, 1880, p. 140). Not only in November, but in many other months, does this particular radiant point manifest itself. I have summarised the positions from September to December, though the shower is still sustained with equal definiteness until May:—

Radiant	Epoch	Observer or authority
° °		
155+41	Sept. 8–October	D. From Zezioli's obs.
156+41	September 15-16	D. Obs. in 1877
153+42	October 16	D. Obs. in 1877
152+38	October 14	D. Obs. in 1879
160+40	November 7, 1869	Tupman (estimated)
149+38	November 1-15, 1872	D. From Italian obs.
157+46	November 11-15	Denza
155+35	November 13-15	Perry. Obs. in 1879
154+41	November 14-17	D. Obs. in 1885
155+36	November 25-27	D. Obs. in 1876
154+39	December 6-7	Backhouse
160+40	December 8-9	Backhouse
152+43	December 9-12	D. From various foreign obs.
149+45	December 9	Schiaparelli and Zezioli

The positions marked "D." are those resulting from my own observations or reductions. The two radiants at 160° + 40°, by Tupman and Backhouse, may possibly relate to another bordering shower, but the position is very close to the mean of all at

154°·4 + 40°·4.

This is a shower (or series of showers) which eminently stands in need of further investigation. The radiant appears to be stationary and continuous for a long period. The shower at 166° + 31°, 10° north of δ Leonis, which I detected this year, has escaped me before, though it was seen at Stonyhurst in 1879, November 13-15, at 166° + 22°. As to position No. 5 in my present list, I saw that well on November 12, 1877, at 125° + 40°. With reference to the radiant No. 4 at 144° + 50°. close to θ Ursæ, I have not recognised it in November until this year, but in October last I determined a good radiant at 143° + 49° from meteors seen in the morning sky.

These circum-Leonid streams reappear with more or less distinctness every year, and their radiant points are sharply defined. It would be well to thoroughly study the durations of several of them, now that their positions have been ascertained with a considerable degree of accuracy by several observers.

Bristol, November 19 WILLIAM F. DENNING

NOTES FROM THE OTAGO UNIVERSITY MUSEUM

VII.—*On some Models Illustrating Phyllotaxis*

PHYLLOTAXIS is a subject which presents special difficulties to the student when illustrated only by diagrams and by actual specimens of plants. With these aids alone it entails an expenditure of time, out of all proportion to the importance of the subject, to make clear in a lecture or demonstration the principles of leaf-arrangement and the mode of construction of the leaf-diagram.

FIG. 1.

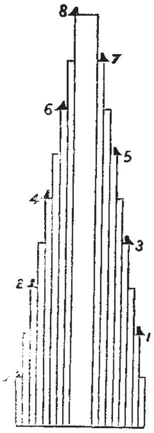

FIG. 2

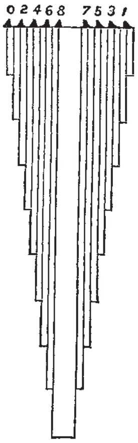

FIG. 3.

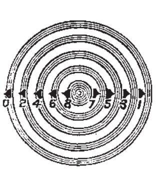

FIG. 4

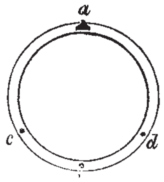

FIG. 5

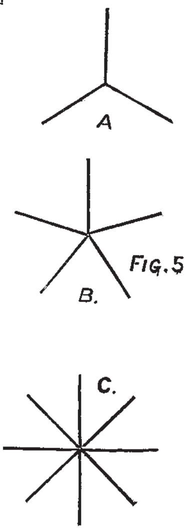

FIG. 1.—Vertical section of model, one-eighth actual size; 0-1, the leaf knobs.

FIG. 2.—The same, telescoped, the upper edges of all the cylinders being brought to one level.

FIG. 3.—The same, telescoped, and viewed from above.

FIG. 4.—One of the cylinders from above: *a*, the fixed leaf-knob; *b*, *c*, *d*, holes for the insertion of movable knobs.

FIG. 5.—Wire stars to represent orthostichies: A, for divergence of one-third; B, for two-fifths; C, for three-eighths.

I find the model about to be described of great assistance in explaining these matters. It consists of a "nest" of nine con-

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centric cylinders, made of some hard wood (Fig. 1), the outermost 2 inches high, the others increasing in height by regular increments of 2 inches up to 18 inches. The cylinders are $\frac{1}{4}$ inch thick, except the innermost, which is a solid rod 1 inch in diameter: they are made so as to slide easily upon one another in any direction. The exposed portion of each cylinder, 2 inches in length, represents an internode, its upper edge a node. On the upper edge of each is fixed a small wooden knob (Fig. 1, 0–8) representing a leaf-insertion, and of such a size as to project slightly beyond the cylinder to which it is attached. By revolving the cylinders these knobs can be made to take up positions representing any divergence from $\frac{1}{2}$ to $\frac{5}{8}$; higher divergences would of course require a greater number of cylinders and consequently a larger and more unwieldy apparatus. In the figures the cylinders are shown adjusted to a divergence of $\frac{1}{2}$. The adjustment is facilitated by holding above the model a straight wire in the case of $\frac{1}{2}$ divergence, or a 3-, 5-, or 8-rayed wire star (Fig. 5, A, B, C) in the case of higher divergence. The genetic spiral is best shown by winding a piece of string round the model.

To explain the construction of the leaf-diagram, the whole apparatus is "telescoped" by simply lifting the lower cylinder: as the latter is raised each cylinder in turn is caught by the projecting portion of the leaf-knob of the next higher cylinder, until finally the upper edges—*i.e.* the nodes—of all nine are brought to one level, or in other words, the internodes are suppressed (Fig. 2). Then by observing the model end-on (Fig. 3), nine concentric circles are seen, each representing a node, and having a leaf-insertion in the appropriate position. To make this clearer, the upper edges of the cylinders are painted alternately light and dark, as in Fig. 3. The resemblance of the model in this position to the leaf-diagram is made still clearer by placing over it a straight wire or wire star (Fig. 5) to represent the orthostichies, and bring out the precise meaning of the angle of divergence.

For the illustration of whorled arrangements movable leaf-knobs are provided which can be inserted in small holes (Fig. 4, *b*, *c*, *d*) in the edges of the cylinders. By placing one of these movable knobs in *b* opposite to the fixed knob *a*, a 2-leafed whorl is produced; by placing knobs in *c* and *d*, a 3-leafed whorl. By revolving the cylinders successive whorls can be made either alternate or superposed.

I tried at first, some four years ago, a model having all the cylinders of the same height, each fitting rather tightly into the next lower one, which overlapped it about half an inch. But I found it impossible to get this arrangement to work satisfactorily, owing to the irregular contraction and expansion of the wood and the weight of the upper cylinders.

In addition to this model I find it very useful to have each divergence separately illustrated by a model having the form of a truncated cone 18 inches in height. The cone is painted white: black circles are drawn round it at regular intervals to represent nodes, on which black knobs are fixed for leaves: the orthostichies are painted yellow, and the genetic spiral red. In the case of the higher divergences these models are useful for showing the relations of the parastichies and the method of determining the divergence from them. Two secondary spirals running in opposite directions are made by passing two pieces of differently coloured string round the cone in opposite directions, each having a turn given to it round each leaf-knob in the parastichy it represents.

T. JEFFERY PARKER

Dunedin, N.Z., October 9

UNIVERSITY AND EDUCATIONAL INTELLIGENCE

CAMBRIDGE.—Dr. Vines has been appointed Honorary Secretary of the General Board of Studies for business connected with the lists of lectures issued by the Board.

Dr. A. S. Lea, Fellow of Gonville and Caius College, has been approved for and admitted to the degree of Doctor in Science.

A temporary iron dissecting-room for Human Anatomy is to be erected on space adjacent to the present Anatomical Schools. Over 145 men are engaged in dissection this term.

The honorary degree of Master of Arts has been conferred on Mr. Walter Heape, Demonstrator of Animal Morphology.

The Public Orator (Mr. J. E. Sandys), in presenting Mr. Heape for the degree, observed that Mr. Heape, *quantum inter lucrum et laudem intersit expertus*, had relinquished the brilliant prospects open to him in a mercantile career and had deliberately preferred to devote himself to scientific pursuits. In 1879 he was attracted to Cambridge by the high reputation of the late Mr. F. M. Balfour, and after working with him for three years in the newly-founded Morphological Laboratory, he had, during the three years that had elapsed since Prof. Balfour's lamented death, done good service as Demonstrator of Animal Morphology. In prosecuting his favourite studies he had considered nothing too small, nothing too great, for his attention; he had not only investigated the early development of the mole, but had also secured for the University Museum an exceedingly rare specimen of a wild male African elephant, which he had killed with his own hand in the South of Africa. "Magnum profecto est ultimâ ex Africâ spoliis opimis onustum redîsse; laudem vero majorem eidem distinat virtus—

"Diadema tutum
Deferens uni, propriamque laurum,
Quisquis ingentes oculo irretorto
Spectat acervos."

An examination for two minor Scholarships will be held at Downing College on June 1, 2, and 3, 1886. The examination in Natural Sciences will include most of the subjects of the Natural Sciences Tripos except Geology and Mineralogy, but no one will be examined in more than three subjects, and great weight will be attached to proficiency in one subject.

The Clothworkers' Exhibition of 52*l.* 10*s.* a year for Physical Science has been awarded to Mr. G. A. Shaw; the Exhibition of 30*l.* to Mr. J. Morgan.

The Antiquarian Museum is growing in value by the donations, both general and local, which it has received. The Curator, Baron von Hügel, has accomplished much in the arrangement of the objects, and has himself deposited valuable collections on loan.

SCIENTIFIC SERIALS

THE *Botanical Gazette* (Indianapolis) for September and October is chiefly occupied by a report of the papers read in the Botanical Section of the American Association for the Advancement of Science at its Ann Arbor meeting. These furnish satisfactory evidence of the good work doing in this branch of science on the American continent, and will not suffer from comparison with a similar record at any of the recent meetings of our own Association. The following are the titles of the papers read:—J. C. Arthur, proof that Bacteria are the direct cause of the disease in trees known as pear-blight.—C. R. Barnes, the process of fertilisation in *Campanula americana*.—C. E. Bessey, the question of bi-sexuality in the Zygnemaceæ.—C. E. Bessey, further observations on the adventitious inflorescence of *Cuscuta glomerata*.—T. J. Burrill, the mechanical injury to trees by cold.—D. H. Campbell, the development of the prothallia of ferns.—J. M. Coulter, on the appearance of the relation of ovary and perianth in the development of dicotyledons.—W. G. Farlow, notes on some injurious fungi of California.—E. L. Sturtevant, an observation on the hybridisation and cross-fertilisation of plants.—E. L. Sturtevant, germination studies.—As far as these papers are reported here, we may note Mr. Arthur's, Mr. Barnes's, Mr. Campbell's, and Mr. Coulter's as giving especially good evidence of a capacity for original work. Another interesting feature of this number is the report of the proceedings of the "Botanical Club," which held daily meetings during the session of the Association, with an attendance in all of no less than eighty-five members.

SOCIETIES AND ACADEMIES

LONDON

Royal Society, November 19.—"On Variations in the Amount and Distribution of Fat in the Liver-Cells of the Frog." By J. N. Langley, M.A., F.R.S., Lecturer on Histology in the University of Cambridge.

The fat in the liver-cells is at its maximum amount in February and March. In April it rapidly decreases; from May until December it is present in comparatively small though varying amount.

Generally speaking, the fat globules form an inner zone in frogs which have hungered more than a week. In January, February, and March, however, the fat-globules are commonly more numerous in the outer part of the cells, often forming a distinct outer zone.

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